

REMARKS

Claims 1-12 and 21-32 are pending examination in the application. Claims 13-20 and 33-34 have been withdrawn. Claims 1 and 21 have been amended. Support for the amendment may be found in the Instant Specification, Page 6, paragraph [0022].

The instant Amendment should be entered as the amendment clarifies the issues for Appeal and more specifically claims the present invention.

Claim Rejection 35 U.S.C. § 102

35 U.S.C. § 102(b)

Claims 1 and 8-12 stand rejected under 35 U.S.C. §102(b) as being anticipated by Yanai et al. United States Patent Number 5,742,792, (hereinafter, Yanai). Applicant respectfully traverses. As currently amended, Claim 1 recites, “a primary storage volume suitable for storing data, wherein the primary storage volume is linked to the primary controller such that, the primary storage controller is capable of cyclic redundancy checking data stored on the primary storage volume.” Yani fails to anticipate the present invention as Yani does not disclose performing a CRC check on data stored in the primary storage volume. Instead, Yani (Col. 40, lines 17-31, reproduced below) teaches sending data with a subsequent CRC transmission. Nowhere does Yani teach a storage controller capable of cyclic redundancy checking data stored on the primary storage volume. The other cited sections of Yani (provided below) merely teach a first in first out (FIFO) system for data transmission without making any provision for CRC data stored on a primary storage volume. “An anticipating reference must describe the patented subject matter *with sufficient clarity and detail* to establish that the subject matter existed and that its existence *was recognized by persons of ordinary skill in the field of invention.*” *ATD Corp.v. Lydall, Inc.*, 48 USPQ.2d 1321,1328 (Fed. Cir. 1998) citing *In re Spada*, 15 USPQ.2d 1655, 1657 (Fed. Cir. 1990). Emphasis added. Therefore, Yani does not disclose each and every limitation and as required to prove a *prima facie* case of anticipation. Removal of the

pending rejection under 35 U.S.C. §102(b) is respectfully requested and allowance is earnestly solicited.

contiguous records can be specified. Also, with this format, the track and record identifications can be built up and appended into the link buffer 505 as write channel command words are decoded by the channel adapter, and the data for 15 each write channel command word is loaded into cache at the indicated starting addresses.

Each link adapter scans the link queue 504 in an iterative loop, looking for unlocked entries to service, beginning at the head of the queue. The link adapter locks the next entry 20 to service, checks the password to determine if the entry is valid, and if so, gets the buffer pointer from the entry, reads the buffer, and builds a job to be executed for transferring data from cache across the link in a direct memory access (DMA) operation. In particular, the link adapter builds a 25 header, and transmits over the link the header, followed by the data, followed by a cyclic redundancy check (CRC). The header, for example, contains a command code such as a code for read or write access, link and command status flags, the logical volume number of the secondary (R2) volume to 30 access, and the invalid track count for the secondary (R2) volume.

Yani, Col. 40, lines 17-31.

when a writeback operation to disk has been completed. The pointer is also kept off the LRU queue 503 for remote write pending in the synchronous, semi-synchronous, and adaptive copy—write pending mode in order to retain the remote write pending data in cache.

The FIFO link transmission queue 504 was described above with reference to step 415 of FIG. 8. In the preferred implementation, this link queue 504 is used in connection 50 with the link buffer 505 in order to prepare information for transmitting commands and data over the link 240 from the link adapter 236 to the remote or secondary data storage system 246 in FIG. 18. The commands transmitted over the link 240 include a write command for a remote write to a 15 secondary (R2) volume in the secondary data storage system 246, and a read command for reading data from a secondary volume (R2) in the secondary data storage system. Each

Yani, Col. 38, lines 2-17.

K. Servicing of the FIFO Link Transmission Queue 40
Turning now to FIG. 18, some components in FIG. 4 are shown in order to depict data structures in the cache 228. These data structures include the volume and track tables 501, logical tracks of data 502, a least-recently used (LRU) queue 503, the FIFO link transmission queue 504, and a link 45 buffer 505.

Elements of the volume and track tables 501 have been shown and described above with reference to FIGS. 3 and 4. The volume and track tables serve as an index to the logical tracks of data in the cache and stored on disk. The volume 50 and track tables include information identifying the location of each logical track on disk; whether the track image is currently in the cache and if so where; some demographic data such as dates and time stamps about the logical tracks; whether the track image is synchronized with an internal or 55 remote copies; and whether a particular record on the logical track has been modified and is pending a write to disk or to a remote copy.

Blocks of cache memory are dynamically allocated when needed to store the logical tracks of data 502. The least- 60 recently-used (LRU) queue 503 contains pointers to cache blocks that are available to be allocated. When a cache block is needed, the pointer at the head of the LRU queue 503 identifies the cache block that should be allocated. If the cache block is needed for a read operation, the pointer is 65 placed at the tail of the LRU queue 503. If the cache block is needed for a write operation, the pointer is taken off the

Yani, Col. 37, lines 40-67.

By this paper Claim 10 has been amended to substantially include the limitations of Claim 11. Entry is requested as this amendment clarifies the subject matter of Claims 11 and dependant Claim 12 for Appeal. The Office is incorrect that Yani teaches or discloses utilizing volatile memory to maintain a coarse grain bit map if communication is interrupted. The cited portions of Yani (Col. 29, lines 41-44 and 45-52; Col. 36, lines 10-25; and now added Col. 35, lines 15-60) disclose, respectively, Col. 29 - (1) "marking" all

updated tracks within the data structure or (2) accumulating all data for the second volume in invalid tracks in the cache of the primary storage volume (lines 40-50); Col. 35-36 disclose, a migration of data which requires an active communication link. Yani noted that in situations in-which migration occurs, processing on the primary volume must be suspended. Yani, Col. 34, lines 60-67. The cited portion of Yani then discloses that the system requires that the primary and secondary volumes are synchronized, thereby requiring an active communication link. Claim 10 recites, further comprising a volatile memory linked to the primary storage controller, the volatile memory is suitable for maintaining a coarse grain bit map if the communication channel is interrupted. Removal of the pending rejection under 35 U.S.C. §102(b) to Claims 10 and 12 is respectfully requested.

Claim Rejection 35 U.S.C. § 103

35 U.S.C. § 103(a)

When applying 35 U.S.C. 103, the following tenets of patent law must be adhered to: (A) the claimed invention must be considered as a whole; (B) the references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination; (C) the references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; and (D) reasonable expectation of success is the standard with which obviousness is determined. *See MPEP § 2141 and Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5, 220 USPQ 182, 187 n.5 (Fed. Cir. 1986).

Claims 2-5 stand rejected under 35 U.S.C. §103(a) over Yani in view of Bauer et al., United States Patent Number 5,870,759 (hereinafter Bauer). The rejection is traversed.

The Yani reference does not teach utilizing a primary or secondary controller to initiate a CRC of the data on a storage volume. The Office is incorrect that Bauer corrects this

deficiency. Bauer on the whole discloses a server/client relationship in-which the client, upon reestablishment of communication, compares all current data (a current-image of data) with all the preexisting data (before-image of client data) to detect if modification has occurred and then forwards the modifications to the server for determining what changes have taken place. This is time consuming. Additionally, the combination of Yani/Bauer fails to teach utilizing a CRC of data stored on the primary volume but rather utilizes a checksum of a log table Tb for error detection. Bauer, Col. 10, lines 25-26. The Bauer system is inherently error prone as it relies on a checksum methodology for interrogating a log table rather than conducting a scan of stored data. Moreover, Bauer fails to teach or suggest a system utilizing CRC of stored data as recited in the claims because Bauer teaches/suggests a system in which all data (all client data) must be communicated to the client in order to detect modifications before the modifications are propagated to the server. Bauer, Col. 2, lines 9-24. The cited portion of Bauer Col. 9 discloses a synchronization between a server and client in which a client table is consulted (lines 35-40). As *prima facie* case of obviousness under 35 U.S.C. §103(a) does not exist, removal of the pending rejection under 35 U.S.C. §103(a) to Claims 2-5 is respectfully requested and allowance solicited.

Claims 6 and 7 are believed to be allowable based on the same rational as discussed with respect to the pending rejection under 35 U.S.C. §102(b) to Claim 1. As Yani fails to disclose CRC data stored on the primary volume the asserted combination of Yani in-view of "Official Notice" is inapplicable. Applicant will not burden the record further. In-light of the foregoing, removal of the pending rejection under 35 U.S.C. §103(a) to Claim 6 and 7 is respectfully requested and allowance solicited.

Claims 21 and 28-32 are pending a rejected under 35 U.S.C. §103(a) over Yani in view of Howard et al., United States Patent Number 6,629,198 (hereinafter Howard). The rejection is respectfully traversed.

Yani fails to disclose conducting at least one of a MD-5 and a SHA-1 scan of data stored in the primary storage volume as recited in Claim 21. Yani only teaches a first in first out (FIFO) system for data transmission without making any provision for one of MD-5 or a SHA-1 scanning of data stored on a primary storage volume. The Howard reference fails to correct this defect. Howard on the whole discloses a system in which a “write-ahead” hash log is maintained within non-volatile storage. Howard, Col. 4, lines 42-43. In Howard, a write ahead hash table is created including values corresponding to modified cache block. Thus, the asserted combination of Yani/Howard, on the whole would suggest the utilization of a write-ahead hash log for use in communication rather than the present invention in which at least one of a MD-5 and a SHA-1 scan of data stored in the primary storage volume is utilized for incoherency correction. Neither the cited portions of Howard, nor anywhere in Howard is utilizing at least one of a MD-5 and a SHA-1 scan of data stored in the primary storage volume but rather indicates the nature of the hash values within the hash table disclosed. As such, Howard fails to correct the deficiencies of Yani. In-light of the foregoing, removal of the pending rejection under 35 U.S.C. §103(a) to Claims 21 and 28-32 is respectfully requested and allowance solicited. Claims 26 and 27 are believed to be allowable as both depend from Claim 21. Applicant will not burden the record further.

Regarding Claims 30-32, Applicant respectfully traverses the rejection. Neither the cited portions of Yani nor anywhere in Yani is utilizing a storage controller capable of at least one of a MD-5 and a SHA-1 scanning data stored on the primary storage volume taught or suggested. The cited portion of the Yani reference discloses (1) “marking” all updated tracks or (2) accumulating data for the second volume in invalid tracks in the cache of the primary storage volume. Yani Col. 29, lines 41-44 and 45-52, respectively. Yani fails to teach how “marking” is accomplished thereby failing to teach maintaining a coarse grain bitmap as recited in the claims. In the second example, all data is stored, rather than

storing a coarse grain bitmap as recited in the claims. *Id.* Removal of the pending rejection under 35 U.S.C. §103(a) is respectfully requested and allowance is earnestly solicited.

Claims 22-25 are pending a rejected under 35 U.S.C. §103(a) over Yani in-view of Howard, further in-view of Bauer. The rejection is respectfully traversed. Applicant respectfully forwards the arguments presented with respect to Claim 21 to Claims 22-25 from which the instant claims depend. Applicants in the previous correspondence noted that the additional arguments were directed solely to the Yani/Bauer thus a *prima facie* case of obviousness commensurate with the additional subject matter of Claims 22-25 would have to be shown solely in the Yani and Bauer references. While the Yani/Bauer/Howard portion had been previously argued with respect to Claim 21 from which Claims 22-25 depend.

The Office is correct that Yani fails to disclose a system in which a primary storage controller initiates at least one of a MD-5 and a SHA-1 scan of the primary storage volume upon reestablishment after an interruption in the communication channel. The Office is incorrect that Howard/Bauer correct this deficiency in the Yani reference. As discussed previously, Bauer on the whole discloses a server/client relationship in-which the client, upon reestablishment of communication, compares all the current data with all the preexisting data (before-image of client data) to detect if modification has occurred. Bauer fails to teach or suggest a system as recited in the claims because Bauer teaches/suggests a system in which all data (all client data) must be communicated to the client in order to detect modifications before the modifications are propagated to the server. Bauer, Col. 2, lines 9-24. The combination of Yani/Bauer/Howard fails to teach utilizing at least one of a MD-5 and a SHA-1 scan of data stored on the primary volume but rather utilizes a checksum of a log table Tb for error detection. Bauer, Col. 10, lines 25-26. The Bauer system is inherently error prone as it relies on a checksum methodology for interrogating a

log table rather than conducting a scan of data stored on the primary volume. In-light of the foregoing, reconsideration is respectfully requested and allowance is earnestly solicited.

Claims 26 and 27 are pending a rejection under 35 U.S.C. §103(a) over Yani in-view of Howard, further in-view of Official Notice. The rejection is respectfully traversed. Claims 26 and 27 are believed to be allowable based on their dependence from Claim 21, which is currently amended, which is believed to be allowable. In-light of the foregoing, reconsideration is respectfully requested and allowance is earnestly solicited.

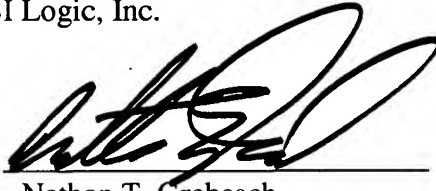
CONCLUSION

In light of the forgoing, reconsideration and allowance of the claims is earnestly solicited.

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Respectfully submitted,
LSI Logic, Inc.

By



Nathan T. Grebasch
Reg. No: 48,600

SUITER · WEST · SWANTZ PC LLO
14301 FNB Parkway, Suite 220
Omaha, NE 68154-5299
Telephone: (402) 496-0300
Facsimile: (402) 496-0333